

WHAT IS CLAIMED IS:

1. A scanning optical apparatus, comprising;
light source means;
a first optical element that converts a light
5 flux emitted from the light source means;
a second optical element that converts the
light flux emitted from the first optical element
into a longitudinal linear image in a main scanning
direction;
10 a deflection element that deflects the light
flux emitted from the second optical element;
a third optical element that guides the light
flux deflected by the deflection element to a surface
to be scanned;
15 a synchronous detection element that obtains a
synchronous signal; and
a fourth optical element that guides the light
flux deflected by the deflection element to the
synchronous detection element,
20 wherein the second optical element and the
fourth optical element are independent of each other,
and
in a case where a point at which a principal
ray traveling toward a scanning center on the surface
25 to be scanned is deflected by the deflection element
is assumed as a reference point, the second optical
element is located at a position which is farther

from the reference point than the fourth optical element.

2. A scanning optical apparatus according to
5 claim 1, wherein in a case where a focal distance of
the third optical element within a main scanning
section is given as $f_{f\theta}$ and a focal distance of the
fourth optical element within the main scanning
section is given as f_{BD} , a condition,
10 $f_{f\theta}/3 < f_{BD} < f_{f\theta}$
is satisfied.

3. A scanning optical apparatus according to
claim 1, wherein in a case where a focal distance of
15 the third optical element within a main scanning
section is given as $f_{f\theta}$, an imaging magnification of
the third optical element within a sub scanning
section is given as $\beta_{f\theta}$, and a focal distance of the
second optical element within the sub scanning
20 section is given as f_{c1} , a condition,
 $f_{c1} > f_{f\theta}/(2|\beta_{f\theta}|)$
is satisfied.

4. A scanning optical apparatus according to
25 claim 1, wherein the second optical element includes
a cylindrical lens.

5. A scanning optical apparatus according to claim 1, wherein the fourth optical element includes an anamorphic lens and is capable of imaging a light flux at a position where the synchronous detection element is disposed or in a vicinity thereof within a main scanning section.

6. A scanning optical apparatus according to claim 1, wherein the fourth optical element includes a lens made of plastic.

7. A scanning optical apparatus according to claim 1, wherein the light source means is an independent modulatable multi-beam light source.

8. A scanning optical apparatus according to claim 1, further comprising a reflecting mirror that changes an optical path of the light flux, which is disposed on an optical path from the light source means to the deflection element.

9. A scanning optical apparatus according to claim 1, wherein the fourth optical element is disposed in a region sandwiched between an optical path from the light source means to the deflection element and an optical path from the deflection element to the surface to be scanned.

10. A scanning optical apparatus according to claim 1, wherein the light source means and the synchronous detection element are disposed on the same electrical board.

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11. A scanning optical apparatus for scanning plurality of surfaces to be scanned, comprising;

plurality of light source means;

a plurality of first optical elements that

10 converts light fluxes emitted from the plurality of light source means;

at least one second optical element that

converts the plurality of light fluxes emitted from the plurality of first optical elements into

15 longitudinal linear images in a main scanning direction;

at least one deflection element that deflects the plurality of light fluxes from the at least one second optical element for scanning;

20 at least one third optical element that guides the plurality of light fluxes emitted from the at least one deflection element to the plurality of surfaces to be scanned;

25 a synchronous detection element that obtains a synchronous signal; and

at least one fourth optical element that guides the plurality of light fluxes emitted from the at

least one deflection element to the synchronous detection element,

wherein the second optical element and the fourth optical element are independent of each other,

5 and

in a case where a point at which a principal ray traveling toward a scanning center on the surface to be scanned is deflected by the deflection element is assumed as a reference point, the second optical
10 element is located at a position which is farther from the reference point than the fourth optical element.

12. A scanning optical apparatus according to
15 claim 11, wherein in a case where a focal distance of the third optical element within a main scanning section is given as $f_{f\theta}$ and a focal distance of the fourth optical element within the main scanning section is given as f_{BD} , a condition,

20 $f_{f\theta}/3 < f_{BD} < f_{f\theta}$

is satisfied.

13. A scanning optical apparatus according to
claim 11, wherein in a case where a focal distance of
25 the third optical element within a main scanning section is given as $f_{f\theta}$, an imaging magnification of the third optical element within a sub scanning

section is given as β_{f0} , and a focal distance of the second optical element within the sub scanning section is given as f_{c1} , a condition,

$$f_{c1} > f_{f0}/(2|\beta_{f0}|)$$

5 is satisfied.

14. A scanning optical apparatus according to claim 11, wherein the second optical element includes a cylindrical lens.

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15. A scanning optical apparatus according to claim 11, wherein the fourth optical element includes an anamorphic lens and is capable of imaging a light flux at a position where the synchronous detection
15 element is disposed or in a vicinity thereof, within a main scanning section.

16. A scanning optical apparatus according to claim 11, wherein the fourth optical element includes
20 a lens made of plastic.

17. A scanning optical apparatus according to claim 11, wherein the light source means is an independent modulatable multi-beam light source.

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18. A scanning optical apparatus according to claim 11, further comprising a reflecting mirror that

changes an optical path, which is disposed on an optical path from the light source means to the deflection element.

5 19. A scanning optical apparatus according to claim 11, wherein the fourth optical element is disposed in a region sandwiched between an optical path from the light source means to the deflection element and an optical path from the deflection
10 element to the surface to be scanned.

 20. A scanning optical apparatus according to claim 11, wherein the light source means and the synchronous detection element are disposed on the
15 same electrical board.

 21. An image forming apparatus, comprising:
a scanning optical device according to any one of claims 1 to 10;

20 a photosensitive member disposed on a surface to be scanned;

 a developing unit that develops, as a toner image, an electrostatic latent image, which is formed on the photosensitive member scanned by the scanning
25 optical device using a light flux;

 a transferring unit that transfers the developed toner image to a material to be

transferred; and

a fixing device that fixes the transferred
toner image to the material to be transferred.

5 22. A color image forming apparatus,
comprising:

a scanning optical device according to any one
of claims 11 to 20;

a plurality of photosensitive members disposed
10 on the plurality of surfaces to be scanned;

a plurality of developing units that develop,
as toner images, electrostatic latent images, which
are formed on the photosensitive members scanned by
the scanning optical device using the plurality of
15 light fluxes;

a plurality of transferring units that transfer
the developed toner images to materials to be
transferred; and

a fixing device that fixes the transferred
20 toner images to the materials to be transferred.

23. An image forming apparatus, comprising:

a scanning optical device according to any one
of claims 1 to 10; and

25 a printer controller that converts code data
inputted from an external device into an image signal
and outputs the image signal to the scanning optical

device.

24. A color image forming apparatus,
comprising:

5 a scanning optical device according to any one
of claims 11 to 20; and

 a printer controller that converts code data
inputted from an external device into an image signal
and outputs the image signal to the scanning optical
10 device.